

11/PAT

TITLE OF THE INVENTION**Connection Piece For A Fuel Pump**BACKGROUND OF THE INVENTION

5        The invention relates to a connection piece for a fuel pump having a receiving device in which a plug is arranged which has electrical contacts for connecting an electric motor of a fuel pump to a mains supply, the plug being extrusion-coated with plastic.

10      Connection pieces of this type are used in fuel pumps of present-day motor vehicles in order to close off a common housing of the electric motor and a pump stage, and are known from practice. For installation purposes, the electrical contacts are inserted through the openings provided in the connection piece. A sealing ring arranged in the region of the electrical contacts prevents fuel from escaping. This makes it possible for the delivery pressure generated by the fuel pump to be maintained by the connection piece and fed to a connector of a forward-flow line. The costs of the sealing ring and its installation are disadvantageous in the case of the known connection piece. In addition, the electrical contacts may damage the plastic connection piece during installation of the latter.

15      Furthermore, a connection piece has been disclosed from practice in which the plug is extrusion-coated by the plastic of the connection piece. This likewise requires very complicated production of the connection piece.

20      The invention is based on the problem of designing a connection piece of the type mentioned in the introduction in such a way that it is particularly simple to produce and install.

BRIEF DESCRIPTION OF THE INVENTION

25      According to the invention, this problem is solved in that the plug has an integrally formed, circumferential sealing lip. The sealing lip is produced in one working step together with the plastic extrusion coating of the plug.

This design means that the connection piece according to the invention does not require a sealing ring to seal off the plug, and thus requires particularly few components needing to be installed. It is not necessary to extrusion-coat the plug in order to seal it off from adjacent components of the connection piece according to the invention. The connection piece according to the invention can therefore be produced in a particularly simple manner.

The plug in the connection piece is effectively sealed off if the sealing lip is arranged on the plug in the region of the bushing of the electrical contacts.

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In order to increase the sealing action, the sealing lip has a region which points in the direction of the electrical contacts. Orienting the sealing lip in this way has the advantage that the sealing lip is deformed during installation of the plug in the connection piece. Elastic deformation of the sealing lip also has the effect that the sealing lip is prestressed in the installed state, as a result of which the sealing action is increased.

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Since, in the connection piece according to the invention in the installed state on the fuel pump, the pressure of the fuel acts on the plug from one side only, the orientation of the sealing lip in the direction of the electrical contacts has the further advantage that the internal pressure in the fuel pump is used for sealing off the plug. On account of its design, this pump presses the sealing lip against the connection piece, whereby the contact-pressure force of the sealing lip against the connection piece increases as the pressure inside the fuel pump increases.

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Production of the connection piece according to the invention is further simplified if the plug is arranged with a transition or press fit in a recess in the receiving device.

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According to another advantageous development of the invention, it is particularly simple to preinstall the plug in the receiving device if the receiving device and the plug have mutually corresponding latching means. The latching means are therefore used as installation aids for the plug.

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The connection piece known from practice has an inserted metal bearing bush for mounting a shaft of the electric motor of the fuel pump. However, installation of

the connection piece according to the invention is further simplified if a pot-like recess which is in the form of a bearing eye for the direct mounting of the shaft of the electric motor is provided next to the receiving device. This means it is no longer necessary to insert and fix a separately produced bearing bush into the connection piece according  
5 to the invention.

It is simple to integrate a large number of components in the connection piece according to the invention if two guides for brushes of the electric motor which are connected to the plug are provided next to the receiving device.

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The connection piece according to the invention can be produced in a particularly cost-effective manner from plastic by the injection-molding process and can be axially removed from the injection mold in a simple manner if the receiving device, the guides and the pot-like recess are arranged parallel to one another.

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According to another advantageous development of the invention, corrosion of connections of electrical lines can be reliably avoided if the plug has a plastic extrusion coating, and if the plastic extrusion coating surrounds connections of the electrical contacts having lines which lead to the brushes.

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It is possible to avoid electrostatic charging of the connection piece according to the invention with particularly low structural complexity if a grounding conductor which projects from the plug is directed as far as a lower edge of the connection piece, this edge being provided for connection to a housing of the electric motor.

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#### **BRIEF DESCRIPTION OF THE DRAWINGS**

The invention permits numerous embodiments. In order to further clarify its basic principle, one of these embodiments is illustrated in the drawings and is  
30 described below. In the drawings:

- Figure 1: shows a schematic illustration of a fuel pump having a connection piece according to the invention,
- 35 Figure 2: shows a partial section through the inventive connection piece from Figure 1, and

Figure 3: shows a greatly enlarged illustration of a detail III of the inventive connection piece from Figure 2.

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## DETAILED DESCRIPTION OF THE INVENTION

Figure 1 shows a fuel pump having a pumping stage 2 of a motor vehicle which is driven by an electric motor 1 and having a connection piece 4 fixed to a housing 3. The connection piece 4 has a connector 5 for a forward-flow line which leads to an internal combustion engine of the motor vehicle. Furthermore, the connection piece 4 has electrical contacts 6 for the electric motor 1 of the fuel pump.

Figure 2 shows an enlarged partial section through the connection piece 4 from figure 1. The electrical contacts 6 are arranged on a plug 7. The plug 7 is extrusion-coated with a plastic casing 8 from which protrude reactors 9 and two brushes 10 for a collector of the electric motor 1 from figure 1. The brushes 10 are led in elongate guides of the connection piece 4 and are prestressed in the direction of the electric motor 1 illustrated in figure 1 by means of a spring element. The plug 7 is held in a receiving device 12 of the connection piece 4 by latching means 11 and penetrates a recess 14 in the connection piece 4 with an edge 13. Furthermore, the center of the connection piece 4 has a pot-like recess for the direct mounting of a shaft of the electric motor 1. A grounding conductor 16 is led from the plug 7 as far as the lower edge of the connection piece 4.

Figure 3 is a greatly enlarged illustration of the region of the edge 13 of the plug 7, and the recess 14 in the connection piece 4. It can be seen here that the plastic casing 8 of the plug 7 is in direct contact with the recess 14 in the connection piece 4 by means of its edge 13. In the region of the electrical contacts 6, a circumferential sealing lip 17 is integrally formed on the plastic casing 8 of the plug 7. The sealing lip 17 has a region 18 which points in the direction of the electrical contacts 6 so that the sealing lip 17 is connected to the connection piece 4 in the installed state. When fuel is conveyed through the fuel pump illustrated in figure 1, an overpressure is produced inside the housing 3, this overpressure acting on the plug 7 and thus on the sealing lip 17, thereby prestressing the sealing lip 17 against the connection piece 4.

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The edge 13 of the plug 7 and the connection piece 4 are produced from a fuel-

swellable plastic and have a transition fit or press fit. For installation purposes, the plug 7 is therefore inserted into the receiving device 12 of the connection piece 4 until the latching means 11 hold the plug 7 in its position. When contact is made with fuel, the edge 13 and the recess 14 swell up and thus additionally seal off the plug 7 from  
5 the connection piece 4.